Abstract:

"An End-to-end Application of Model Verification and Validation"

François Hemez, XTD-3 Primary Physics Group, Los Alamos National Laboratory

In the last two decades, numerical simulations have increasingly supported decision-making at the U.S. National Laboratories. Examples include predicting the trajectories of hurricanes, anticipating the consequences of terrorist threats, and managing infrastructure in large urban environments. Simulation-based decision raises into question the veracity of numerical models and quantification of prediction uncertainty. This presentation briefly overviews the Verification and Validation (V&V) performed to assess the accuracy of a finite element model. The application is the simulation of a mechanical shock through a threaded assembly using tools developed by the Advanced Scientific Computing (ASC) program at Los Alamos. V&V refers to a broad range of activities carried out to provide evidence that measurements and predictions are scientifically defendable. These activities include the verification that models and algorithms are implemented correctly and perform according to expectation; assessment of numerical uncertainty; validation of models relative to small-scale, separate-effect experiments; and quantification of uncertainty for integral-effect experiments. The presentation does not discuss the mathematical foundations of these techniques; instead, it emphasizes how they can be integrated to answer specific questions. Lessons learned are briefly discussed. (LA-UR-07-8454.)

Short Bio:

François Hemez has been Technical Staff Member at Los Alamos National Laboratory since 1997. He earned a Ph.D. from the University of Colorado in 1993 and graduated from the Ecole Centrale Paris, France, in 1989. At Los Alamos, François spent seven years in the Engineering Division, one of which as leader of the Validation Methods team. In 2005, he joined X-Division, where he managed the code verification project of the Advanced Scientific Computing (ASC) program from 2008-2010 and currently manages the ASC predictive capability assessment project. François developed the first-ever, graduate course taught in a U.S. University (University of California San Diego, 2006) in the discipline of Verification and Validation (V&V). François received the Junior Research Award of the European Association of Structural Dynamics (2005), D.J. DeMichele Award of the Society for Experimental Mechanics (2010), and four U.S. Department of Energy Defense Program Awards of Excellence for applying Verification and Validation to programmatic work at LANL (2006, 2011, 2012). He has authored 350+ technical publications or reports (including 36 peer-reviewed manuscripts), and given 110+ invited lectures or short-courses since 1994.